Oct. 14, 1958 R. F. CHAISER ET AL 2,855,759

GAS DISPENSING SYSTEM

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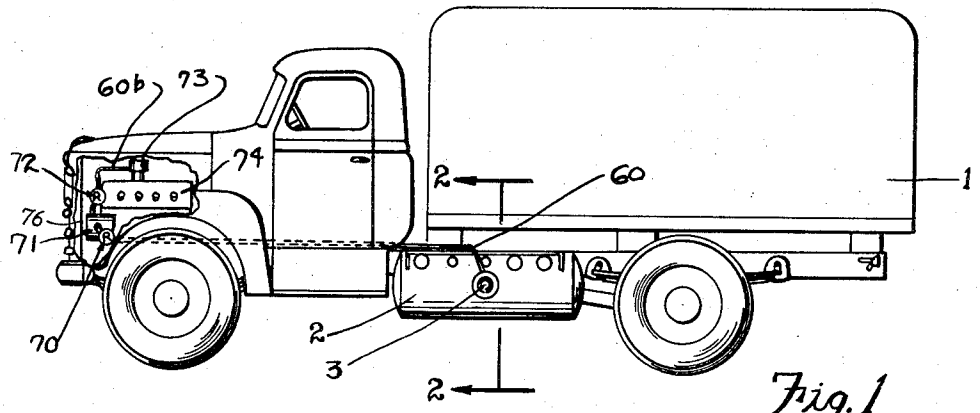


Fig. 1

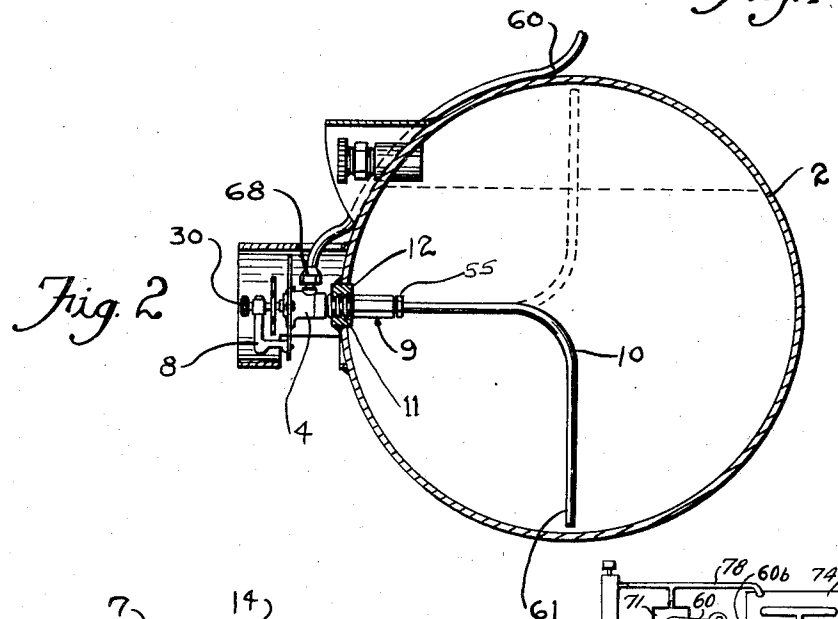


Fig. 2

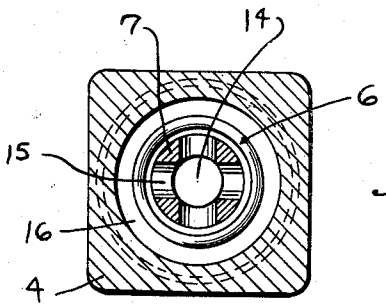


Fig. 7

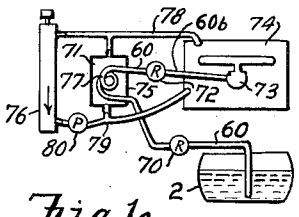


Fig. 1a.

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Fig. 5

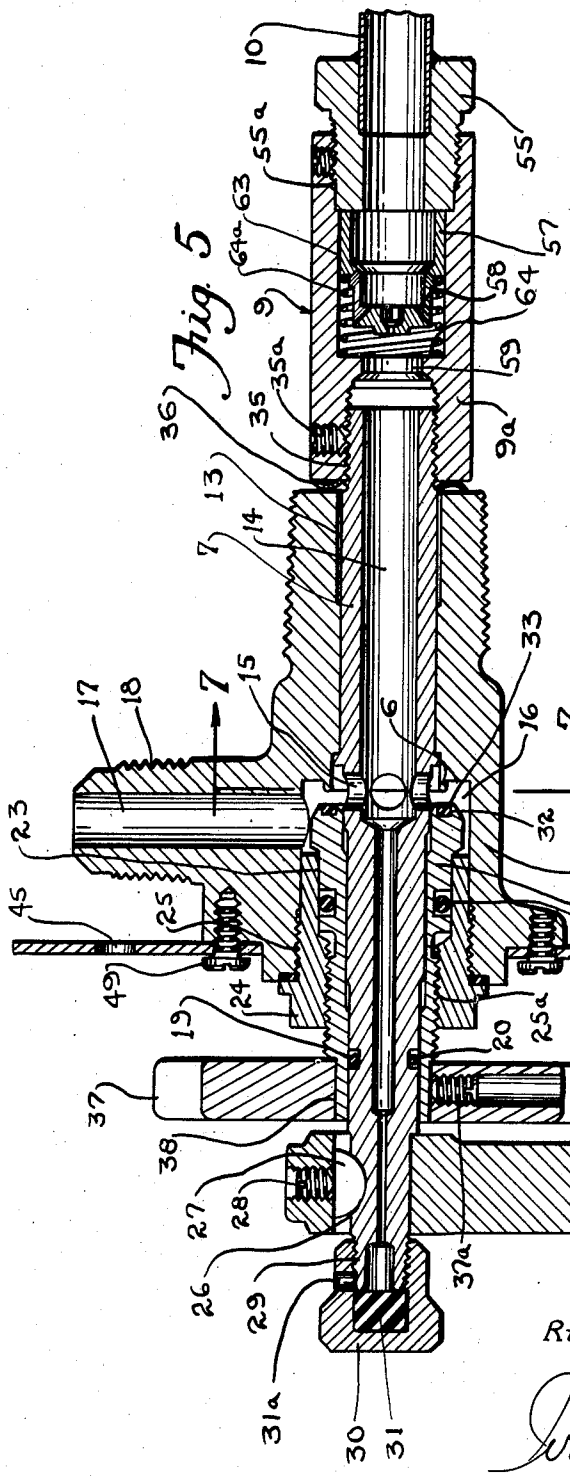
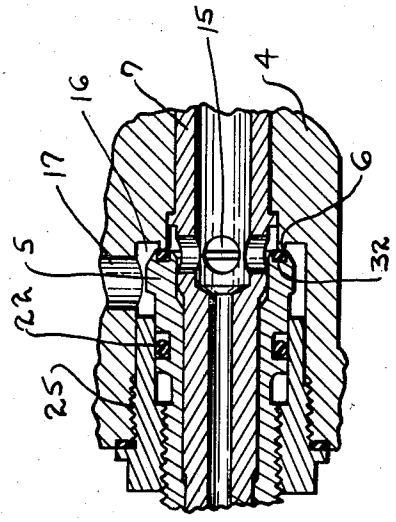


Fig. 6



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GAS DISPENSING SYSTEM

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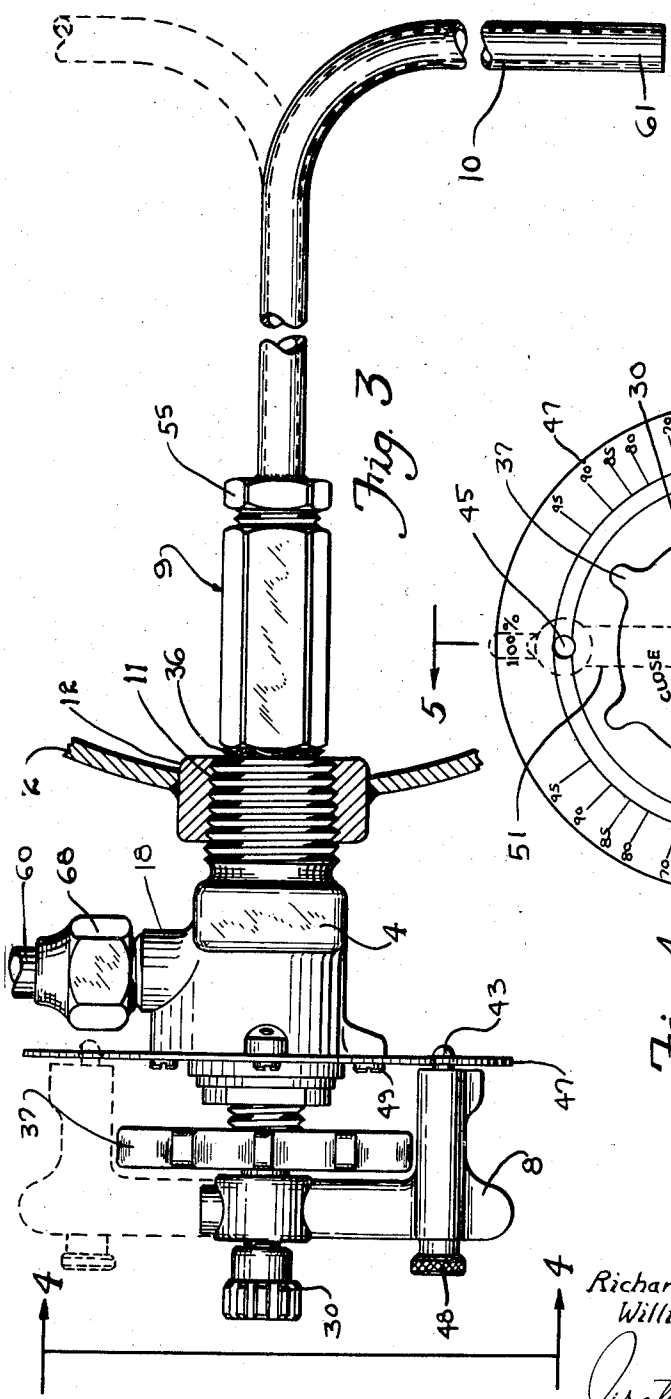


Fig. 3

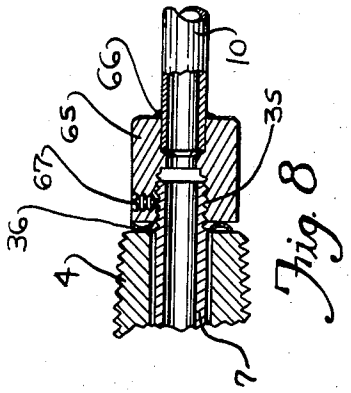


Fig. 8

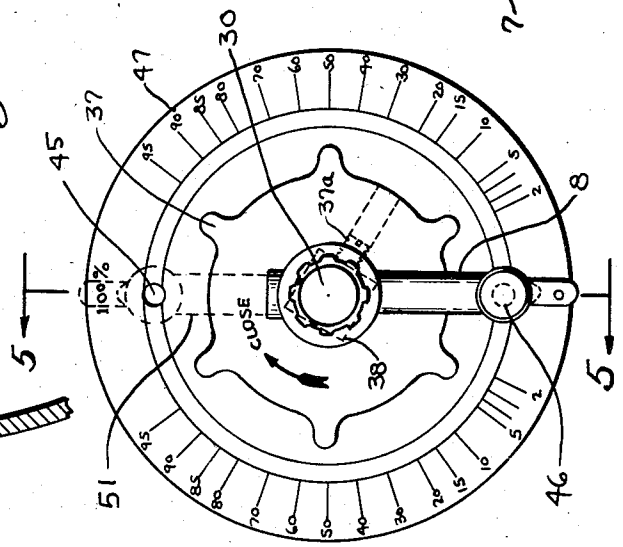


Fig. 4

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2,855,759

GAS DISPENSING SYSTEM

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Application March 29, 1954, Serial No. 419,428

10 Claims. (Cl. 62—51)

The present invention relates to liquefied petroleum gas dispensing systems and, more particularly, to a means by which a combustible gas mixture, stored in its liquid phase, may be dispensed in a novel way for use in starting and running internal combustion engines.

The petroleum product that this system is designed to handle is preferably a hydrocarbon of the paraffin or olefin series such as butane, propane, or butylene, or various mixtures thereof, having a range of boiling points below normal room temperatures but within the expected range of outdoor temperatures. These fuels are usually stored in their liquid and vapor phases in closed containers and the vapor pressure of the fuel is utilized to move gas or liquid to a point of consumption which in the present invention is along a conduit which passes through a vaporizer warmed by the heat of combustion of an internal combustion engine. In its transition, the fuel is expanded and supplied with the necessary latent heat of vaporization to reach the carburetor of the engine in its vapor phase and at a suitable pressure.

There are two types of systems employed in dispensing liquefied petroleum gases generally. One is a "batch" system where vapor fuel is withdrawn from above the liquid in the tank and passed through a pressure reducing regulator on its way to a point of consumption, and the other is the so-called "flash" system in which liquid fuel is withdrawn from the bottom of the tank and passed through a pressure reducing orifice or regulator and supplied with the latent heat of vaporization necessary to vaporize it downstream of the point of pressure reduction.

Wherever the vaporization takes place, heat units are absorbed from surrounding parts and in the batch systems this absorption is from the liquid contents and tank wall causing a refrigerating action which chills the tank, and with the large load of an internal combustion engine, frosts the tank to further lower the available heat in the tank and thereby lower the effective tank pressure so much as to cause fuel and engine failures, whereas in the flash system the heat absorption is concentrated in an area around a pressure reducer or in a vaporizer therebeyond supplied with heat from an outside source.

Moreover, butane has a boiling point of 32° F. and propane has a boiling point of —48° F., and these boiling points are constant for each, even though the two may be mixed. For this reason, in batch systems, propane will continue to vaporize in a storage tank below 32° F., leaving a larger and larger proportion of butane in the remaining liquid. Consequently, since the B. t. u. content of the two gases is different, 91,686 for propane and 103,464 for butane per gallon, it is seen that with batch vaporization in cold atmospheres, the gas delivered at first is of low B. t. u. content, the propane boiling off in greater quantities than butane and the tail end delivery is comparatively high in B. t. u. content, and, as already mentioned, the delivery pressure will fall to inadequate lows.

On the other hand, a flash system takes a small quantity of the liquid mixture from the tank and flashes it

before more liquid is taken, thus maintaining the proportions of the components in the mixture and providing a uniform B. t. u. output throughout the dispensing operations, and locating the heat load where it will not affect materially the eduction pressure effective in the tank during heavy work loads.

In motor vehicles, particularly cross country trucks and others subjected to low atmospheric temperatures, flash vaporization is desirable while the engine is working, the carburetor adjustment can be left at an economical point without danger of misfires or faltering under work loads, and engine performance is uniform. However, with flash vaporization, engine performance requires such large quantities of vaporized gas that vaporizers have to be used to supply the latent heat of vaporiztaion which are 816 B. t. u. for propane and 841 B. t. u. for butane, per gallon.

Although the flash system provides the best working conditions, it is not the preferred system for starting engines when vaporizers are not warm and the vapor pressure can be very low with little heat available in the conduit leading to the motor to supply latent heat vaporization.

In these circumstances, it is preferred to utilize gas already vaporized, and this constitutes one of the objects of the invention in which vapor is dispensed during starting and warm up periods of the engine and liquid is dispensed during the time the engine is subjected to work loads.

A further object of the invention is to provide an improved motor vehicle fuel system which vapor-fills the supply conduit after each shutdown of the motor while the motor is still warm and enables additional vapor to be supplied from the top of the storage container for a starting fuel supply. The short period of time that the system is running on batch vaporization during starting periods is not enough to vary the proportions of the mixture nor lower the tank eduction pressure materially.

The invention is also characterized by an improved liquid level gauge which is quickly brought into operation to determine the amount of fuel in the storage tank when the system is converted from batch to flash vaporization after the engine is warmed up.

Moreover in view of the fact that it is desirable to have as few openings through a high-pressure tank as possible, one of the further objects of the present invention is to provide a unitary construction which performs three main functions in dispensing gas for an internal combustion engine fuel system embodying applicant's invention.

A further object of the invention is to provide a unitary valve arrangement embodying the gas dispensing system of the invention in which the operation as a liquid level indicator is improved by its use as vapor or liquid selector and the eduction can be changed by a single movement of one element from liquid to vapor, or vapor to liquid, without delay and without need for operating valves.

A further object is to provide an improved eduction selector arrangement for the motor vehicle fuel supply which can be switched from liquid to vapor and back to liquid without closing flow of fuel from tank under any circumstances and without danger of withdrawal of fuel from more than one point in the tank at the same time.

The invention is further characterized by an improved liquefied gas dispensing system for motor vehicle internal combustion engines in which dry gas is immediately available to start the engine when it is cold in the conduit leading from the tank to the intake manifold.

A further object of the invention is to provide an arrangement whereby the light ends having low B. t. u. content in a mixture of liquefied petroleum gases having

different boiling points will cause an internal combustion engine to give warning as through it were receiving too lean a mixture if there is a danger due to low temperatures of changing the relative proportion of the mixed gases if the motor is continued upon batch vaporization after it has warmed up.

A further object of the invention is to provide a unitary valve gauge and dispensing construction which is simple in construction, rugged in its use, and easy to understand, operate and service.

These being among the objects of the present invention, other and further objects will become apparent from the following description and the drawings relating thereto, in which:

Fig. 1 is a side elevation of a motor vehicle embodying an improved liquefied petroleum gas dispensing system as a source of internal combustion fuel;

Fig. 1*a* is a diagrammatic view of the pressure control means for the fuel supply system of the invention;

Fig. 2 is an enlarged cross section taken on line 2—2 of Fig. 1;

Fig. 3 is an enlarged side elevation of a selector valve assembly with the dip tube as shown in Fig. 2;

Fig. 4 is a front view of the valve assembly taken on line 4—4 of Fig. 3;

Fig. 5 is a cross section taken on line 5—5 of Fig. 4;

Fig. 6 is a fragmentary view of the center portion of the embodiment shown in Fig. 5 showing the valve seat in a closed position;

Fig. 7 is a cross section taken on the line 7—7 of Fig 5;

Fig. 8 is a fragmentary cross section showing a modification in which a dip tube gauge construction is combined in a cooperative way with a selector valve assembly.

The invention contemplates a liquefied petroleum gas dispensing system in which a unitary body is mounted upon a dispensing tank, preferably half way down on the side thereof, and a shutoff valve is journalled therein with a dip tube rotatably mounted on the valve so that it can be rotated not only to determine the level of liquid in the tank, but also to provide vapor or liquid eduction from the tank, it being a further feature of the invention that with the engine running the dip tube can be raised to its uppermost position to be quickly emptied of any liquid therein and gradually lowered until liquid spurts out of the bleeder valve used when checking the level of the liquid in the tank.

More particularly, in reference to the drawings, there is shown in Fig. 1 a conventional motor vehicle **1** having suspended to the frame thereof in a suitable manner a fuel container or tank **2** for storing liquefied petroleum gas under pressure. Halfway down the outermost side of the tank, where it is exposed for ready access, is mounted a three-way valve assembly **3** of unitary construction. Broadly speaking, the valve assembly **3** comprises a body portion **4** containing a shutoff valve stem **5**, a valve seat **6**, a hollow tube **7**, a selector lever **8**, an excess flow check valve assembly **9**, and a dip tube journalled with respect to the body **4** to be moved by the selector lever **8** to educt either vapor or liquid from the tank **2**.

The valve body **4** is mounted on the tank **2** by means of a threaded engagement indicated at **11** to provide a leakproof joint between the body **4** and the coupling **12** that is welded to the tank **2**.

The valve body **4** is provided with a passage **13** extending completely therethrough in which is disposed the hollow tube **7** having a passageway **14** through the inner end portion thereof leading to a plurality of apertures **15** radially disposed to open into a valve chamber **16**. The valve chamber is in communication with a lateral passage **17** extending through the body outwardly through a threaded male boss **18**. Beyond the passageway **14** the tube is of reduced diameter and has an external groove **19** thereon receiving an O-ring seal **20** made of an elastomer.

Journalled on this reduced portion is a valve stem **5** engaged by the O-ring **20** in sealed relationship. A bonnet **24** threaded as at **25** into the body **4** has an internal thread thereon receiving the valve stem **5** in threaded relationship as at **25***a*. The bonnet **24** is provided with a bore **23** at its inner end to journal the valve stem and serve as a stop for its outward movement as sealed by another O-ring **22** also made of an elastomer.

At the outer end of the hollow tube **7** the selector lever **8** is received on a reduced portion as located in operative position with respect to a slot **26** and key **27** assembly tightly secured in place by a set screw **28**. Beyond the selector lever, the end **29** of the hollow tube **7** is threaded and closed with a threaded cap **30** in which is located a suitable sealing material **31** to provide a bleeder valve assembly. When the cap **30** is tightened on the tube **7** it creates a seal between the end of the hollow tube **7** and the sealing material **31**, but when loosened or backed off a short distance it permits vapor or liquefied gas to escape through a side port **31***a*. The inner end of the valve stem is grooved as at **32** to receive an annular valve disc **33** which engages the circular land valve or seat **34** formed in the body **4** in sealed cooperation to operate as a shutoff valve, a hand wheel **37** being mounted on the square end **38** of the valve stem **5** so that when it is turned in one direction such as a clockwise direction, the valve disc **33** and valve seat **34** close in sealed relationship and when the hand wheel **37** is turned in an opposite direction the valve stem as threadedly mounted at **25***a* carries the valve disc **33** away from the valve seat **34** to provide for the flow of vapor or liquid into the valve chamber in which the valve stem **5** is mounted.

The hand wheel **37** upon the valve stem which is held in place by the set screw **37***a* works inside of the selector lever **8** and in no way interferes therewith, since there is enough space axially for the valve stem to carry the valve disc **33** to its wide open position as held in sealed relationship by the O-ring **20**.

Beyond the periphery of the valve wheel **37** the selector lever **8** is provided with a lock arrangement which includes a plunger **43** urged toward the tank by means of a spring **44** to engage in either one of two of openings **45** and **46** in a circular plate or dial **47** that is secured to the outer face of the valve body **4** by means of screws **49**. The opening indicated at **45** is the topmost opening while the other opening indicated at **46** is the lowermost opening. Retraction of the pin or plunger **43** is accomplished by a knurled knob **48** press fitted on to the outer end thereof so that the pin **43** can be manipulated at will.

Movement is made by raising the knob **48** until the pin clears the opening **46** or **45** after which the selector lever **8** can be moved through 360°. As constructed and arranged, when the pin **43** engages in the opening **46** upon the dial **47**, the indicia are so related as to indicate that the liquid eduction or dip tube is in its lowest position, whereas when the pin **43** is disposed in the opening **45** the indicia are so related as to indicate that the system is operating as a batch vaporization dispenser with the dip tube in its uppermost position.

There are other indicia upon the dial **47** as more particularly illustrated in Fig. 4, which indicates the amount of liquid in the tank. The selector level in its uppermost position, as indicated in the broken lines **51**, also serves as a liquid level gauge to indicate that the tank is filled to proper level, whereas in its lowermost position as indicated in the full lines in Fig. 4 it indicates that the tank is empty. Between these upper and lower limits, graduated in suitable increments upon each side of the dial, are various indicia indicating the percent to which the tank is filled if at any particular setting of the selector lever **8** liquid instead of vapor is ejected through the opening **31***a* of the bleeder valve **30**.

The dip tube **10** is rigidly carried on the inner end of

the tube 7 where the tube is threaded for this purpose as at 35. In the embodiment illustrated in Fig. 5, an excess flow check valve 9 is interposed between the tube 10 and the tube 7, whereas in the embodiment shown in Fig. 8 the tube 10 is connected directly to the tube 7.

Referring to Fig. 5 the excess flow check valve comprises a housing 9*a* having a passageway therethrough 59 threaded at the outer end to mate with the thread 35 as held in locked relationship by the set screw 35*a*. At the other end, the passageway is enlarged as at 63 to provide a shoulder 64 and threaded as at 55*a* to receive a gland nut or adaptor 55 that carries the dip tube 10. Between the inner end of the adaptor 55 and the shoulder 64 is mounted a slug check valve member 57 urged away from the shoulder 64 by means of a compression spring 64*a*. The slug excess flow check valve 57 has a cylindrical surface slidable in the housing 9*a* as at 63 and a reduced end portion having apertures disposed in a radial direction therethrough as at 58 so that if the flow of gas or liquid through the passages 58 is greater in capacity than the passages 58 can carry in the construction disclosed, a pressure differential will be created great enough across the orifices to overcome the effort of the spring 64*a* and the excess flow check valve will close against the shoulder 64.

Such an excess flow check valve is a desirable element in the system but is not a necessary element. As shown in Fig. 8 the adaptor is indicated at 65 and received directly upon the thread 35 where it is held in locked position by the set screw 67, the dip tube 10 being silver soldered in place as indicated by the numeral 66.

A spring washer 36 is inserted between the threaded end of the body 4 and the element which carries the dip tube 10. In the embodiment shown in Fig. 5 the element is the excess flow valve member 9, whereas, in the embodiment shown in Fig. 8 the element is the adaptor 65. The spring 36 removes all slack in the assembly to keep the elements from loosening under the truck vibration, and imparts sufficient frictional resistance to relative rotation of the dip tube 10 to support it in any given position during gauging operations.

At the outlet end of the boss 18, a fuel line or conduit 60 is secured by a compression coupling nut 68 and leads to a regulator 70 which serves preferably as a first stage pressure reducer ahead of a vaporizer 71 that is connected in heat exchange relationship with the water cooling system 76 of the truck. The vaporizer supplies the heat of vaporization to liquid fuel being dispensed through the conduit 60. The outlet side of the vaporizer 71 is connected to a second stage pressure reducer 72 which is set to deliver gas at a pressure slightly below atmospheric pressure. The outlet of the second stage pressure regulator 72, which sometimes is referred to as a demand regulator, is connected to the carburetor 73 of the engine 74 by conduit 60*b*.

For further particularity, as shown in Fig. 1*a* the water cooling radiator 76 of the motor vehicle 1 is connected top to the top of the cooling jacket of the engine 74 by a coinduit 78 and bottom to the bottom of the cooling jacket by a conduit 79 having a pump 80 therein which draws the water, or coolant, downwardly through the radiator and forces it out into the lower conduit 79. The vaporizer 71 is connected between conduits 78 and 79 to receive the benefit of this circulation. It comprises a water jacket 75 having a coil 77 therein disposed in heat exchange with the water circulated therethrough. The coil is connected in the fuel line 60 between regulators 70 and 72 where the heat it receives from the water is utilized as the latent heat of vaporization for the fuel gas flowing through the coil 77.

In operation, during the process of filling the tank the selector lever 8 is released and the indicator end thereof brought to the maximum permitted filling level based on temperature, for instance such as the mark "90%" on the dial 22. This locates the end 61 of the dip tube 10 in a raised position where it indicates the level of liquid in a tank, 90% filled, 10% outage in this instance being required for safety reasons. The liquid is then injected into the tank under pressure and the bleeder valve 30 is opened. Vapor will flow through the bleeder valve passageway 31*a* at a reduced rate with a hissing sound; then when the level of liquid inside of the tank reaches the 90% filled point, liquid will flow through the dip tube 10 and when it reaches the valve 30 it will be ejected with a spitting sound, thereby indicating that the tank has been filled to its legal capacity. The valve 30 is then closed and the selector lever 8 is moved to its uppermost or 100% position where it again receives vapor from the tank. The hand wheel 37 on the valve stem 5 is turned counterclockwise to open the valve at the valve seat 34 to place the interior of the tank in communication with the conduit 60 leading to the internal combustion engine 74. Vapor will then flow progressively through the conduit 60, the regulator 70, the vaporizer 71 and the demand regulator 72 to the carburetor 73. Since it is already vapor it is ready for mixture with air to provide a mixture of fuel and air within the range of ignition without any need for heat to be supplied from the engine. The mere reduction of pressure assures a continued vapor phase once the gas is vapor. Thus the engine can be started cold with little effort and with practically none of the choking which is required with a wet fuel such as gasoline.

Once the engine begins to run, the heat developed in the cylinders is transferred to the cylinder wall and from there to the cylinder water jacket and the water of the cooling system. The warmed water is circulated through the vaporizer and as soon as there is appreciable heat in the vaporizer the selector lever 8 is released from its uppermost position and moved to its lowermost position where it is locked by the pin 43 engaging in the opening 46 in one single motion that eliminates any need for a plurality of selector valves, and multiple handling with danger of leaving all valves "on" or all valves "off" when the operator finishes making changes. This single movement of the selector lever 8 carries the dip tube end 61 to the bottom of the tank where it is supplied with liquid under the vapor pressure existing at the top of the tank without interruption of fuel supply. Under this pressure the liquid is forced through the first stage regulator 70 where it is expanded. With the expansion and the accompanying lowering of pressure occurring, the liquid begins to vaporize and with the latent heat of vaporization added by the vaporizer 71 it is vaporized before it reaches the demand regulator 72. Thereafter the gas in its vapor form is carried through to the engine at a constant B. t. u. content.

As far as the engine carburetor is concerned, there is no change and no interruption in the gas being transmitted therethrough to the intake manifold of the engine, but in those instances where the atmospheric temperature is below the boiling point of butane or even near the boiling point of butane, this dispensing of gas in its liquid phase from the tank to the vaporizer has the advantage of supplying the engine with a fuel of constant B. t. u. content from the very beginning after the tank has been filled until it is completely empty. Thus the uniform performance of the internal combustion engine is assured. Yet, the engine can be started with dry gas even though there is no heat in the vaporizer which would operate to accomplish vaporization of liquid fuel passing therethrough.

Having thus described the invention and several of its embodiments, and having pointed out wherein certain definite advantages are derived from applicant's system, it will be appreciated by those skilled in the art that various and further modifications may be made therein without departing from the spirit of the invention, the scope of which is commensurate with the appended claims.

What is claimed is:

1. In a motor vehicle the combination of a fuel tank for storing liquefied petroleum gas under pressure, a heated fuel supply system including a fuel conduit hav-

ing a body mounted on the wall of said tank and defining an opening therethrough, eduction means journalled in said opening for selective movement of its intake end between the bottom and the top of said tank for educting gas in its liquid phase and vapor phase respectively, a shut-off valve for controlling the flow of gas through said conduit, an excess flow check valve in said eduction means deposed in said tank, and pressure reduction means, said vapor phase eduction providing fuel supply during initial energization stages of said supply system.

2. In a motor vehicle the combination of a fuel tank for storing liquefied petroleum gas under pressure, a heated fuel supply system including a fuel conduit having a body mounted on the wall of said tank and defining an opening therethrough, an eduction tube journalled in said opening for selective movement of its intake end between the bottom and the top of said tank, means for locking said eduction tube in either one of its alternate positions, a shut-off valve for controlling the flow of gas through said conduit, and pressure reduction means at the end of said conduit, said vapor phase eduction providing fuel supply during initial energization stages of said supply system.

3. In a motor vehicle the combination of a fuel tank for storing liquefied petroleum gas under pressure, a heated fuel supply system including a fuel conduit having a body mounted on the wall of said tank and defining an opening therethrough; an eduction tube journalled in said opening for selective movement of its intake end between the bottom and the top of said tank; a shut-off valve for controlling the flow of gas through said conduit; and pressure reduction means connected to the outlet of said conduit, said vapor phase eduction providing fuel supply during initial energization stages of said supply system.

4. In a gas dispensing system having a tank in which liquefied petroleum gas is stored under pressure, a liquid eduction gauging device, comprising an elongated body supported in the wall of the tank and having a passageway therethrough having a bifurcated portion at its outermost end, a shoulder in said passageway defining a valve seat inwardly of said bifurcation, a valve received in one of said bifurcated portions to cooperate with said seat and having a valve stem with an opening therethrough in communication with said passageway, a rotatable dip tube extending through said opening and the passageway into said tank, and having a conduit extending therethrough apertured upstream of said valve seat, a bleeder valve closing the outermost end of said dip tube, collar means fixed to said dip tube disposed at the inner end of said body to engage same in running sealed relationship, means for rotating the dip tube to move the inner end of the dip tube to the top or bottom of said tank, means for operating said valve stem, and conduit means interconnecting the other of said bifurcated portions to a point of gas consumption including pressure reducer.

5. In a gas dispensing system for motor vehicle engines having a tank in which liquefied petroleum gas is stored under pressure, a liquid eduction gauging device, comprising an elongated body supported in the wall of the tank and having a passageway therethrough having a bifurcated portion at its outermost end, a shoulder in said passageway defining a valve seat inwardly of said bifurcated portion, a valve threadedly received in one of said bifurcated portions to cooperate with said seat, and having a valve stem with an opening therethrough in communication with said passageway, a rotatable dip tube extending through said opening and the passageway into said tank, and having a conduit extending therethrough apertured below said valve seat, a bleeder valve closing the outermost end of said dip tube, collar means fixed to said dip tube disposed at the inner end of said body to engage same in running sealed relationship means for rotating the dip tube to move the inner end of the dip tube to the top or bottom of said tank, means for selectively locking at will said dip tube rotating means in either one of its two alternate positions, means for operating said valve stem, and conduit means interconnecting the other of said bifurcated portions to a point of gas consumption including pressure reducer.

6. In a device of the class described, a liquid level gauge comprising an elongated body adapted to be supported in the wall of a container and having a passageway therethrough into said container divided into an inner portion and an outer portion by a shoulder defining a valve seat, a valve stem threaded in the outer portion and having a valve disc adapted to engage said seat, a rotatable dip tube extending through and journalled in said valve stem in sealed relationship and in said inner portion, a bleeder valve on the outer end of said dip tube, said dip tube having apertures through said wall in communication with the inner portion, and a boss upon said body having a passage opening into said outer portion, means for supporting said dip tube against axial displacement outwardly and handle means for rotating said dip tube including a latch for locking said dip tube in any one of a number of positions.

7. In a device of the class described, a fuel eduction device comprising an elongated body adapted to be supported in the wall of a container and having a passageway therethrough into said container divided into an inner portion and an outer portion by a shoulder defining a valve seat, a valve stem threaded in the outer portion and having a valve disc adapted to engage said seat, a rotatable dip tube extending through and journalled in said valve stem in sealed relationship and in said inner portion, said dip tube having apertures through said wall in communication with the inner portion, and a boss upon said body having a passage opening into said outer portion, means for supporting said dip tube against axial displacement outwardly and a handle means for rotating said dip tube including a latch for locking said dip tube in any one of a number of positions and a pointer indicating the position of said dip tube.

8. In a fuel dispensing system for supplying gas in its vapor phase to a place of combustion, the combination of a fuel tank disposed in heat exchange relationship with the atmosphere for storing liquefied petroleum gas in both its liquid and vapor phases under pressure with a vapor space at the top thereof, a fuel conduit means interconnecting the tank with the place of combustion including a body mounted on the wall of said tank and having an opening therethrough, an eduction tube mounted in said opening with its inner end movable from the top to the bottom of the tank, a shutoff valve for controlling the flow of fuel through said conduit, an excess flow check valve in said eduction tube disposed in said tank, means for vaporizing and reducing the pressure upon said fuel in said conduit when said inner end is at the bottom of the tank, and means for operating said eduction tube to move the inner end thereof between the top and bottom of the tank.

9. In a fuel gas dispensing system for supplying gas in its vapor phase to an internal combustion engine having a cooling system, the combination of a fuel tank exposed to atmospheric temperatures for storing liquefied petroleum gas in both its liquid and vapor phases under pressure with a vapor space at the top thereof, a fuel conduit including a body mounted on the wall of said tank and having an opening therethrough, an eduction tube journalled in said opening for selective movement of its intake end between the vapor space and the bottom of said tank, means for moving said eduction tube selectively including an element for locking said eduction tube in either one of its alternate positions, a shutoff valve for controlling the flow of fuel gas through said conduit, and means for vaporizing and reducing the pressure upon

said fuel in said conduit when said intake end is at the bottom of the tank.

10. In a fuel gas dispensing system for supplying gas in its vapor phase to an internal combustion engine having a fluid warmed thereby, the combination of a fuel tank exposed to atmospheric temperatures for storing liquefied petroleum gas under pressure in both its liquid and vapor phases with a vapor space at the top thereof, a fuel conduit including a body mounted on the wall of said tank and having an opening therethrough, an eduction tube mounted in said opening with its inner end movable from a point near the bottom of the tank to a point in said vapor space, a shutoff valve for controlling the flow of gas through said body, a bleeder valve by-passing said shutoff valve to place the eduction tube in communication with the atmosphere, an excess flow check valve in said eduction tube disposed in said tank, and means for vaporizing and reducing the pressure upon said fuel in said conduit when said shut-off valve is open and said eduction tube is disposed with the inner end thereof at a point near the bottom of the tank.

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